NASA GSFC's Integrated Design Capability

IDC Overview Briefing
Topics in Engineering 5 (TE 5)
New Design Paradigms Workshop

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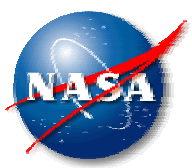


IDC Overview
Agenda

- **Background and Resulting Goddard Environments**
- **Integrated Design Capability**
- **Mission Statement**
- **Characteristics**
  - Services and Products
  - Design Support
  - Areas Represented
  - Tool Sets
  - Study Process Overview
- **Areas of Future Emphasis**
- **Summary**

Background

- **Why Rapid Design Environments ?**
  - Previous process inefficient(e.g., too many meetings, too many people involved, too much juggling study time with project work, etc.)
  - Tied up too much of ever-decreasing resource pool
  - Studies took too long to complete
  - Vulnerable to inconsistent results and possibility of not meeting Customer needs and/or expectations

Resulting Goddard Environments

- **Integrated Mission Design Center (IMDC)**
  - Operational facility since Fall 1997
  - Performed over 100 studies since inception
    - Over 30 studies performed in both CY00 and in CY01
  - http://imdc.nasa.gov
- **Instrument Synthesis & Analsyis Laboratory (ISAL)**
  - Operational facility since Spring 1999
  - Nearly 20 studies performed since inception
    - 6 studies performed in past 4 months; 2 studies consisting of 6 instrument complement
  - http://isal.gsfc.nasa.gov

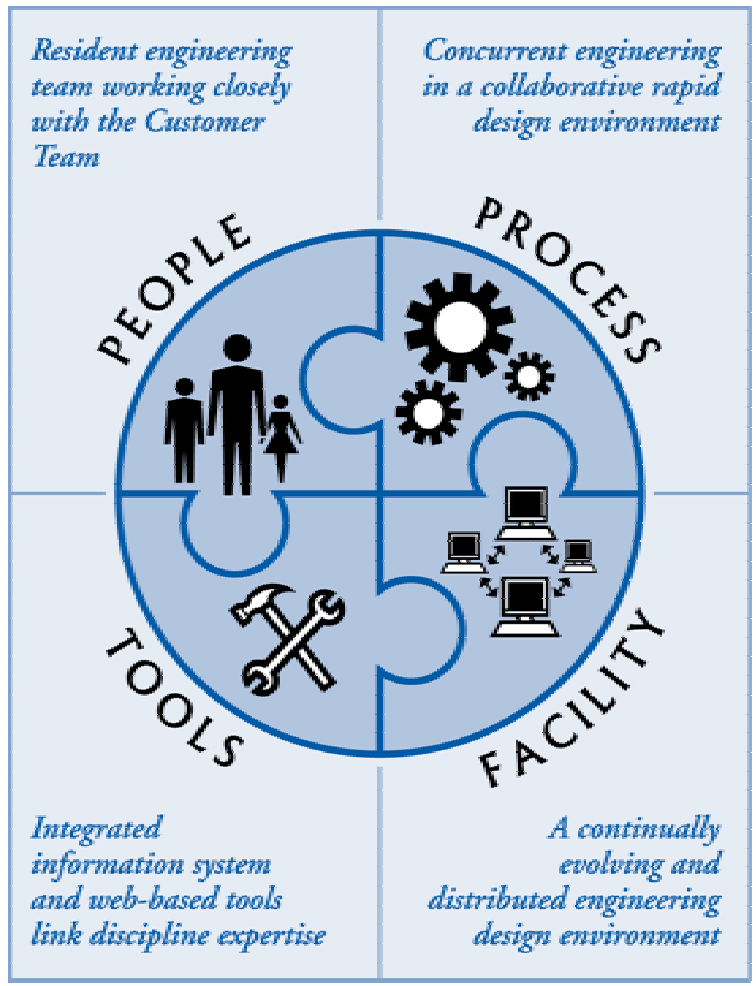
Spring 2001:

Unified the operations and growth of the IMDC and ISAL under one management structure

Integrated Design Capability (IDC)

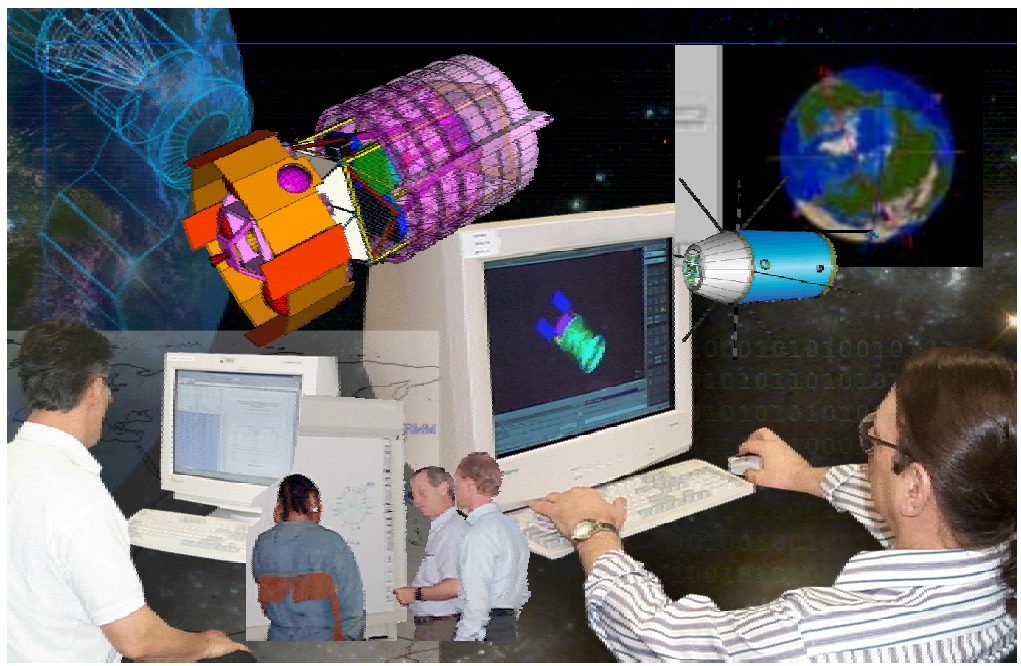
Integrated Design Capability Mission Statement and Approach

- **IDC Mission Statement:**
  - Provide high-quality, rapid mission design and remote sensing instrument concepts that meet or exceed the requirements in the most timely & cost effective manner
  - Include infusion of technology and processes to continually advance our ability to do design work and to extend value of product



IDC Services and Products

- **Serve a diverse group of customers**
  - NASA Centers … all enterprises
  - Academia
  - Other Federal Agencies
  - Industry
- **Ability to support local and/or distributed teams**
- **Provide diverse set of final products in form/media per Customer specifications**
- **Provide diverse services tailored to Customer needs**
  - End-to-End Concept Studies
  - Focused-Studies
  - Independent Technical Assessments
  - Technology and Risk Assessments



IDC Design Support

- **Integrated Mission Design Center**
  - Low earth, geosync, libration orbits, balloon flights, deep space
  - Single spacecraft missions, formation flying, constellations
  - Custom vs. commercial spacecraft
  - Expendable vs. non-expendable launch

- **Instrument Synthesis & Analysis Laboratory: Instrument Families**
  - Planetary Orbiters
  - Cosmic Ray Telescopes
  - X-ray Telescopes
  - Solar Physics Instruments
  - Passive/Microwave Radiometers
  - Infrared Cosmology Instruments/Telescopes
  - Optical Molecular Sensors
  - Large Weather Satellites

IDC Areas Represented

- **Integrated Mission Design Center**

Systems	Power	Spacecraft bus assessment
Mission Design	C&DH	Launch Vehicle
ACS	Communications	Ground Systems
Propulsion	Flight Software	Data Processing
Mechanical - CAD	Reliability	Mission Operations
Thermal	Integration & Test	Costing

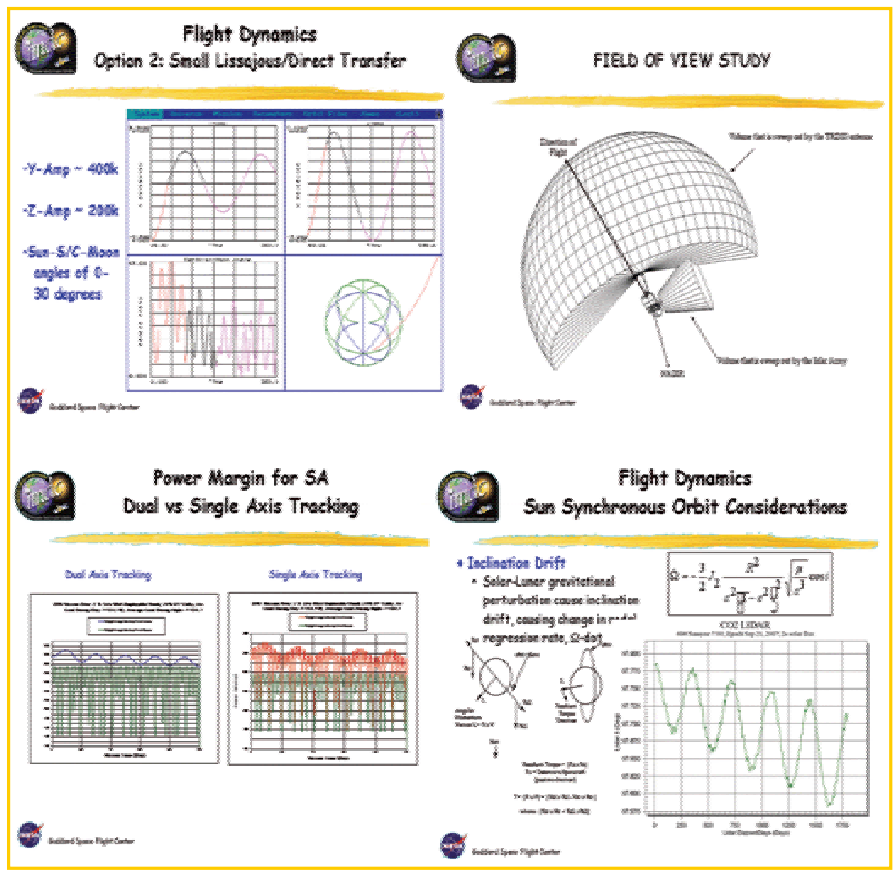
- **Instrument Synthesis & Analysis Laboratory**

Systems	Thermal/cryo	Optical
Electro-mechanical	Opto-mechanical	Detectors
Mechanical Analysis	Integration & Test	Costing

IDC Tool Sets

- **Mix of Commercial-Off-The-Shelf (COTS), Government-Off-The-Shelf (GOTS), and Homegrown, e.g.,**

Satellite Tool Kit	FreeFlyer
IDEAS	Pro-E
FEMAP	SINDA
MathCAD	Code V
Mathematica	ZEMAX
CAGE/CLASS	AutoCad
MATLAB/Simulink	TSS
PASTRAN/NASTRAN	



- **Internal Databases, e.g.,**
  - Pre-Work Databases
  - Mission Design Archives
  - Component Catalogs
  - Spacecraft Bus Catalog

IDC Study Process Overview

- **Initial Contact and Scheduling**
  - 1-4 months prior to need date
- **Planning and Preparation**
  - 1- 6 weeks prior to study execution
- **Study Execution**
  - Dependent on study scope; typically 4 day duration for IMDC end-to-end mission study and on the order of 1-4 weeks for an ISAL instrument study
  - Iterative, collaborative design sessions followed by presentation of final results to Customer Team
- **Study Wrap-Up**
  - 2-3 weeks following study execution

Accelerated mission design process resulting in higher quality product at a fraction of previously required schedule and resources

IDC Future Increased Emphasis

- IMDC and ISAL system and process integration
- Technology infusion and feedback to technology strategic planning
- Knowledge capture and feedback into future missions
- Cost estimation and tracking to requirements and risk
- Distributed Collaborative Environment emphasizing partnerships across design centers
- Extension of data and tools beyond formulation phase demonstrating product utility over full life cycle
- Access to Aerospace vendors' component data bases
- Broader partnership base and implement extended data sharing
- Links to higher end tools, simulations, data models, visualizations, etc.

IDC Summary and Benefits

- **Summary: Proven engineering in updated manner**

  Accelerated development of state-of-the-art, end-to-end mission system concepts have been successfully demonstrated to be feasible and of significant value in an on-going operational environment

- **Benefits:**
  - Increased and improved Customer involvement
  - Improved product consistency and quality
  - Reduced schedule and labor requirement
  - Infusion of end-to-end system perspective
  - Infusion of development experience
  - Improved technology infusion
  - Strategic identification of enabling technologies
  - In place operational test-bed for verifying, applying, and migrating advanced capabilities and products
  - Individual technical and career growth opportunity